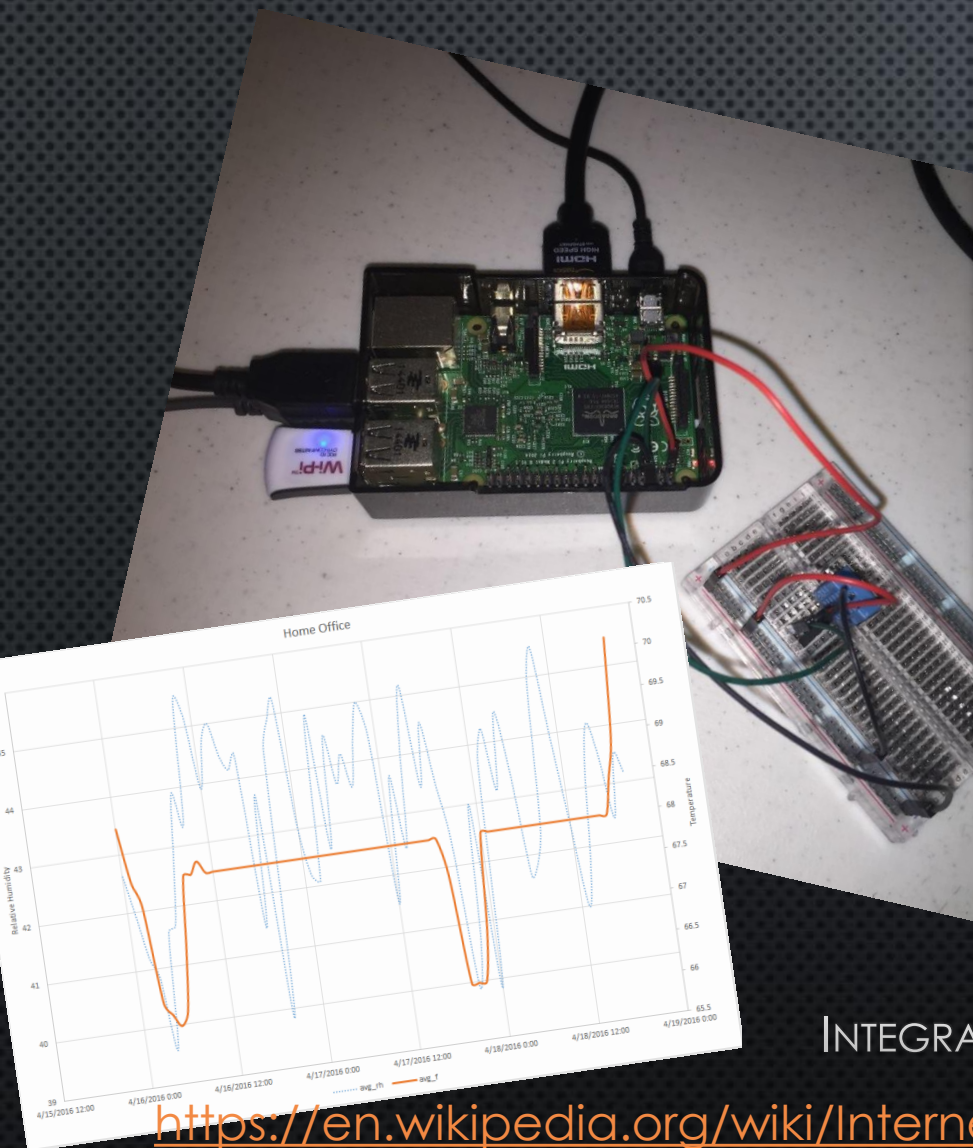


IOT AND U CAN 2

PART 2, CONTROLLING THE WORLD

CHAD BOSCHERT, GRAVITATE SOLUTIONS

WHAT IS THE INTERNET OF THINGS?



Last Reading

75.2°

fahrenheit

24.0°

celsius

39.0%

relative humidity

Off

heater status

last updated 2016-05-16 20:25:24.236000

Target Temp: 24.0

°C

update

Recent (hourly)

Date	Hour	Avg F	Avg C	Avg RH	Heater On %	# of Measures
2016-5-16	20	74.7°	23.7°	37.8%	33.101%	287
2016-5-16	19	68.0°	20.0°	43.2%	0.000%	17
2016-5-12	22	72.5°	22.5°	38.7%	30.024%	413
2016-5-12	21	68.5°	20.3°	47.5%	0.000%	285
2016-5-11	22	71.8°	22.1°	55.3%	0.000%	48
2016-5-11	21	72.9°	22.8°	58.9%	0.000%	80
2016-5-11	20	69.8°	21.0°	53.7%	0.000%	13

DEVICES + NETWORK CONNECTIVITY + EXCHANGE DATA

INTEGRATING PHYSICAL WORLD AND COMPUTER WORLD

IMPROVED EFFICIENCY, ACCURACY, AND ECONOMIC BENEFIT

https://en.wikipedia.org/wiki/Internet_of_Things

RASPBERRY PI

- MULTIPLE VERSIONS, \$5 TO ~\$40
- RASPBERRY PI 2
 - 900MHZ QUAD-CORD CPU
 - 1 GB RAM
 - MICRO SD CARD SLOT
 - 40 GPIO PINS
 - 4 USB PORTS
 - FULL HDMI PORT
 - CAMERA & DISPLAY INTERFACES
 - COMBINED 3.5MM AUDIO JACK & COMPOSITE VIDEO



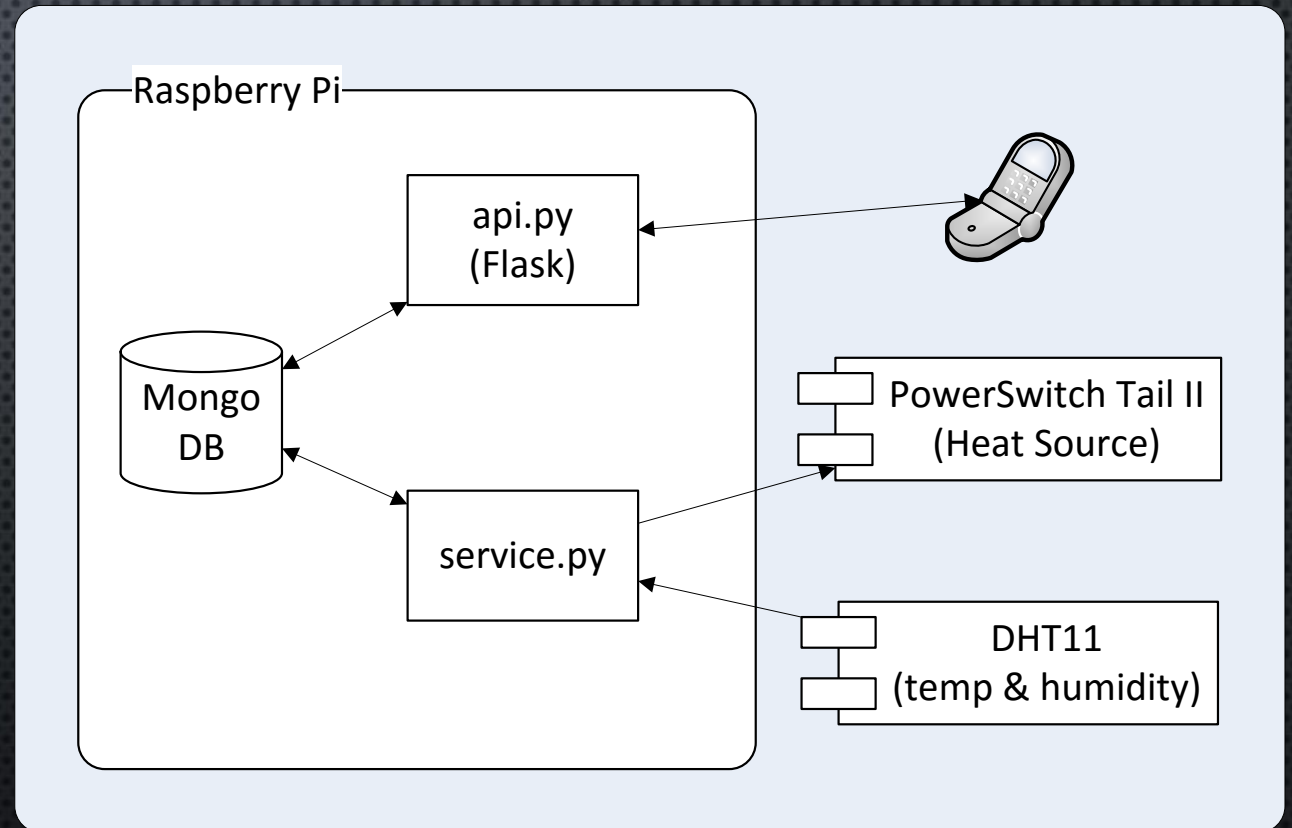
<https://www.raspberrypi.org/products/raspberry-pi-2-model-b/>

FERMONITOR

DIY WINE FERMENTATION TEMPERATURE CONTROL SYSTEM

DESIGN PRINCIPALS

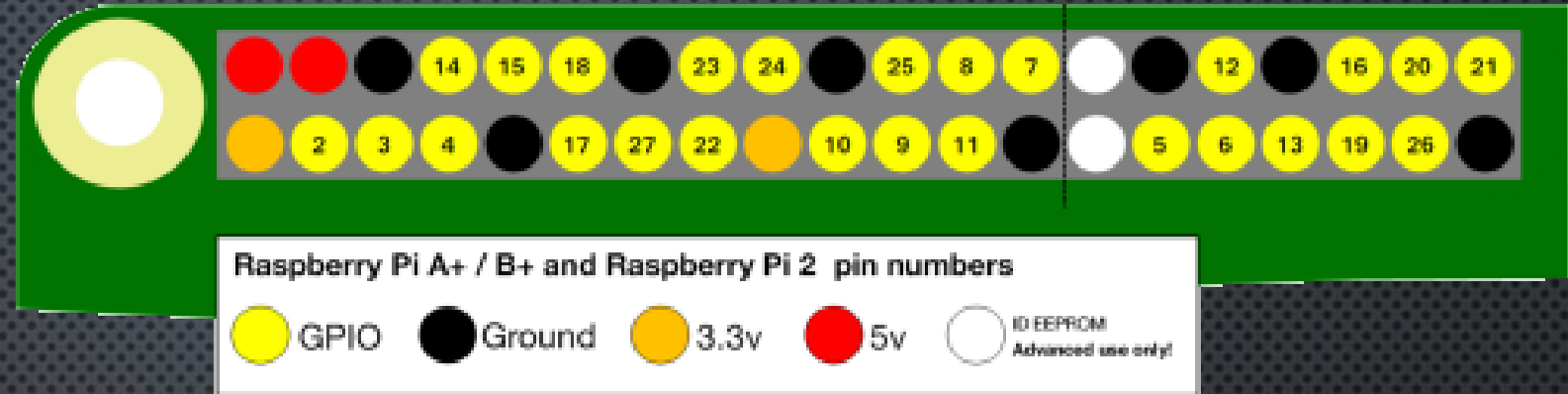
- BE LEAN
 - KEEP IT SIMPLE
 - CREATE VALUE
 - IF IT ALREADY EXISTS, USE IT
 - MAKE IT WORK, THEN IMPROVE LATER IF NEEDED
- YAGNI
- LEARN





DEMO TIME

INTRO TO GPIO

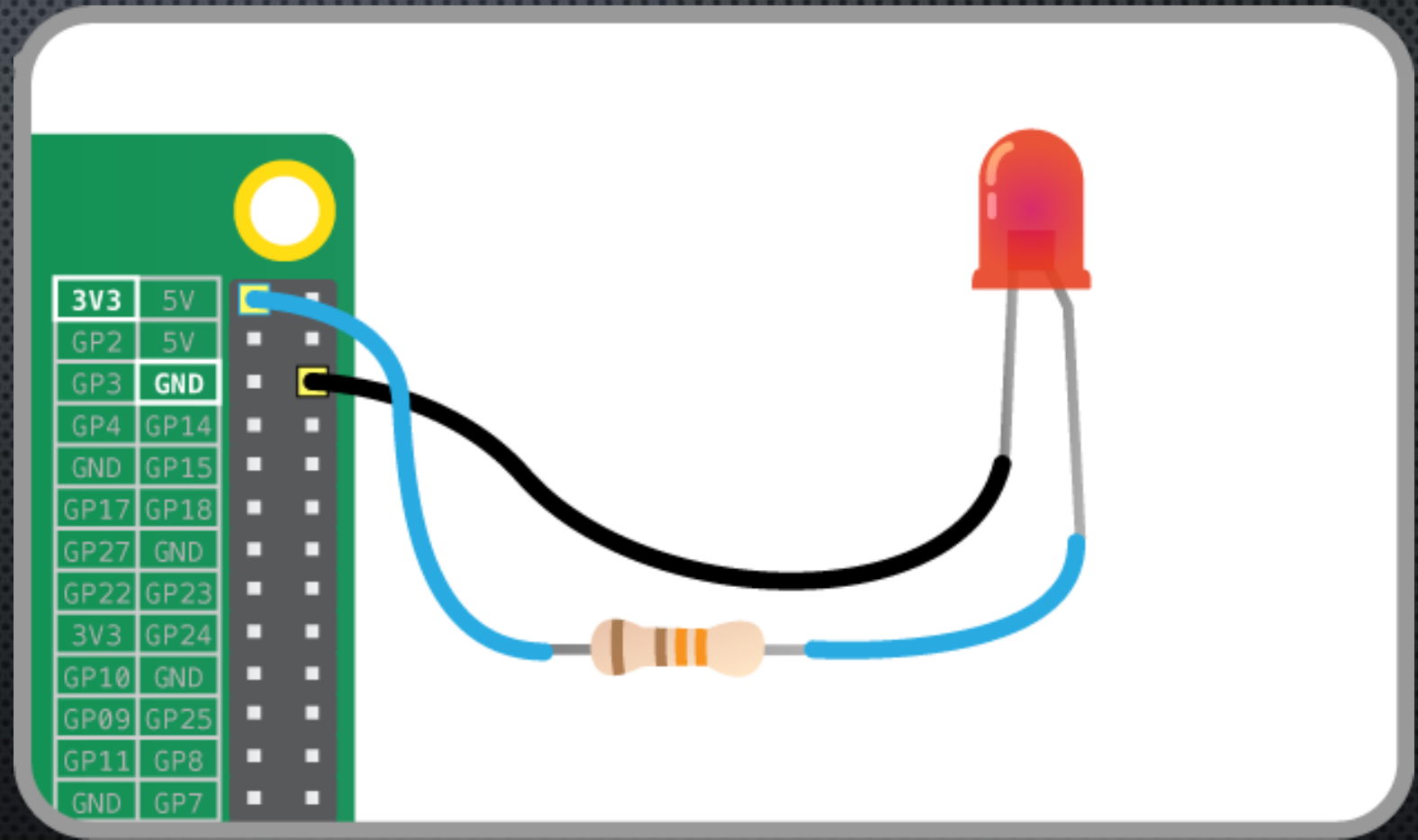


- General-Purpose Input/Output
- Simply, switches
 - Inputs – controlled externally
 - Output – controlled by the Pi
- Ground
 - Zero volts, completes circuits
- 3.3v
 - Provides 3.3 volt power supply
- 5v
 - Provides 5 volt power supply
- GPIO #
 - Configured as input/output

<https://www.raspberrypi.org/learning/physical-computing-with-python/>
<https://sourceforge.net/p/raspberry-gpio-python/wiki/BasicUsage/>

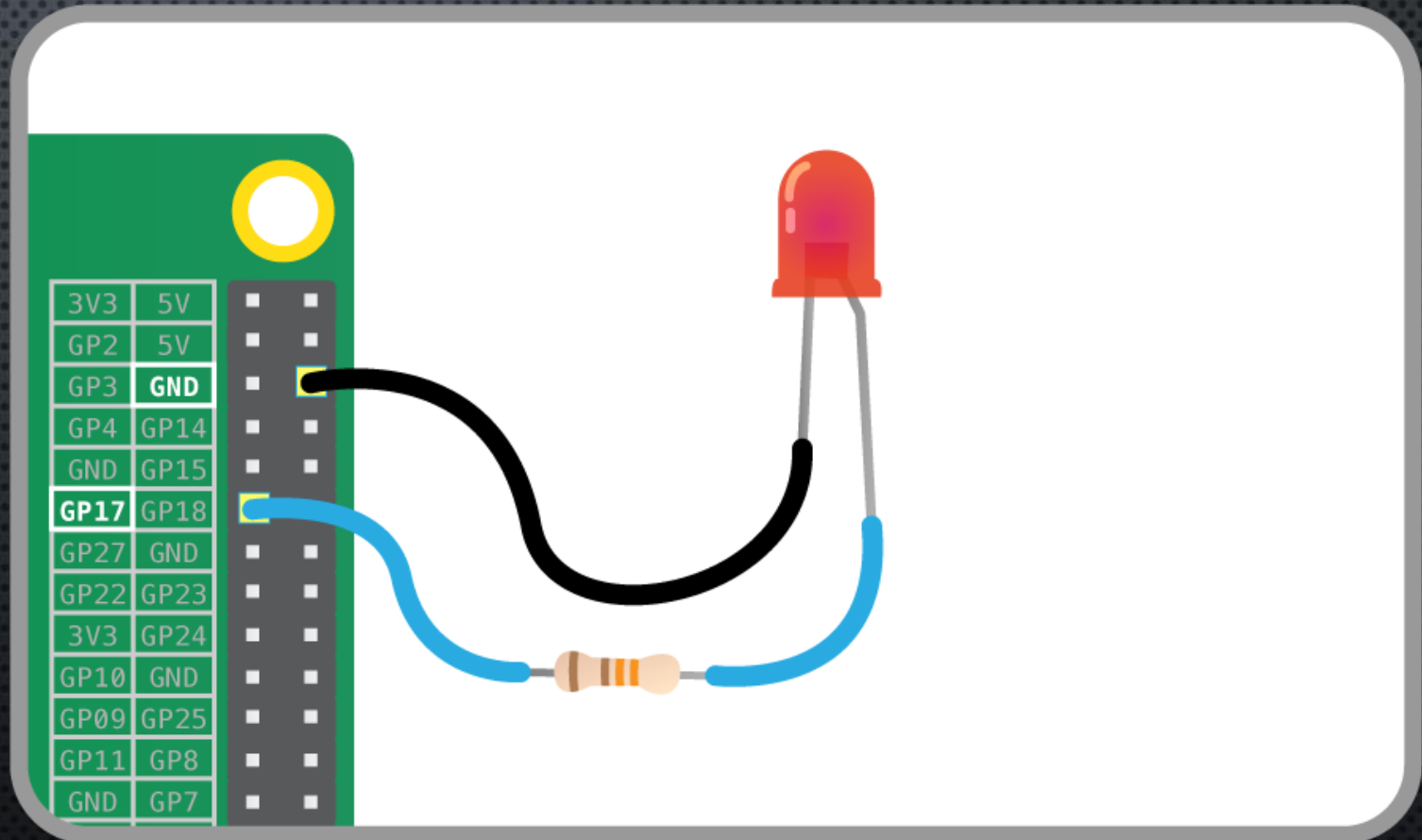
SIMPLE CIRCUIT

- ALWAYS ON



GPIO CIRCUIT

- PROGRAMMATICALLY INTERACTIVE
 - SWITCH OFF/ON
- `GPIO.output(17, GPIO.LOW)`
- `GPIO.output(17, GPIO.HIGH)`



DHT11

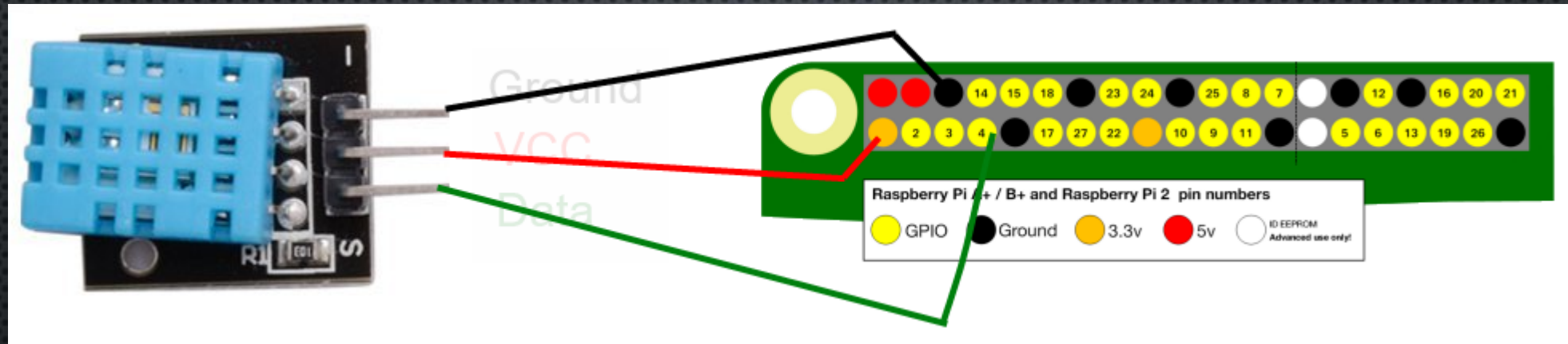
- MEASUREMENT RANGES
 - RELATIVE HUMIDITY 20-90%
 - TEMPERATURE 0-50°C (32-122°F)
- RESOLUTION
 - 1% RH
 - 1°C (1.8°F)
- ACCURACY
 - $\pm 5\%$ RH
 - $\pm 2^\circ\text{C}$ (3.6°F)

<http://www.micropik.com/PDF/dht11.pdf>
https://github.com/szazo/DHT11_Python



Ground
VCC
Data

WIRING DIAGRAM – DHT11



POWERSWITCH TAIL II

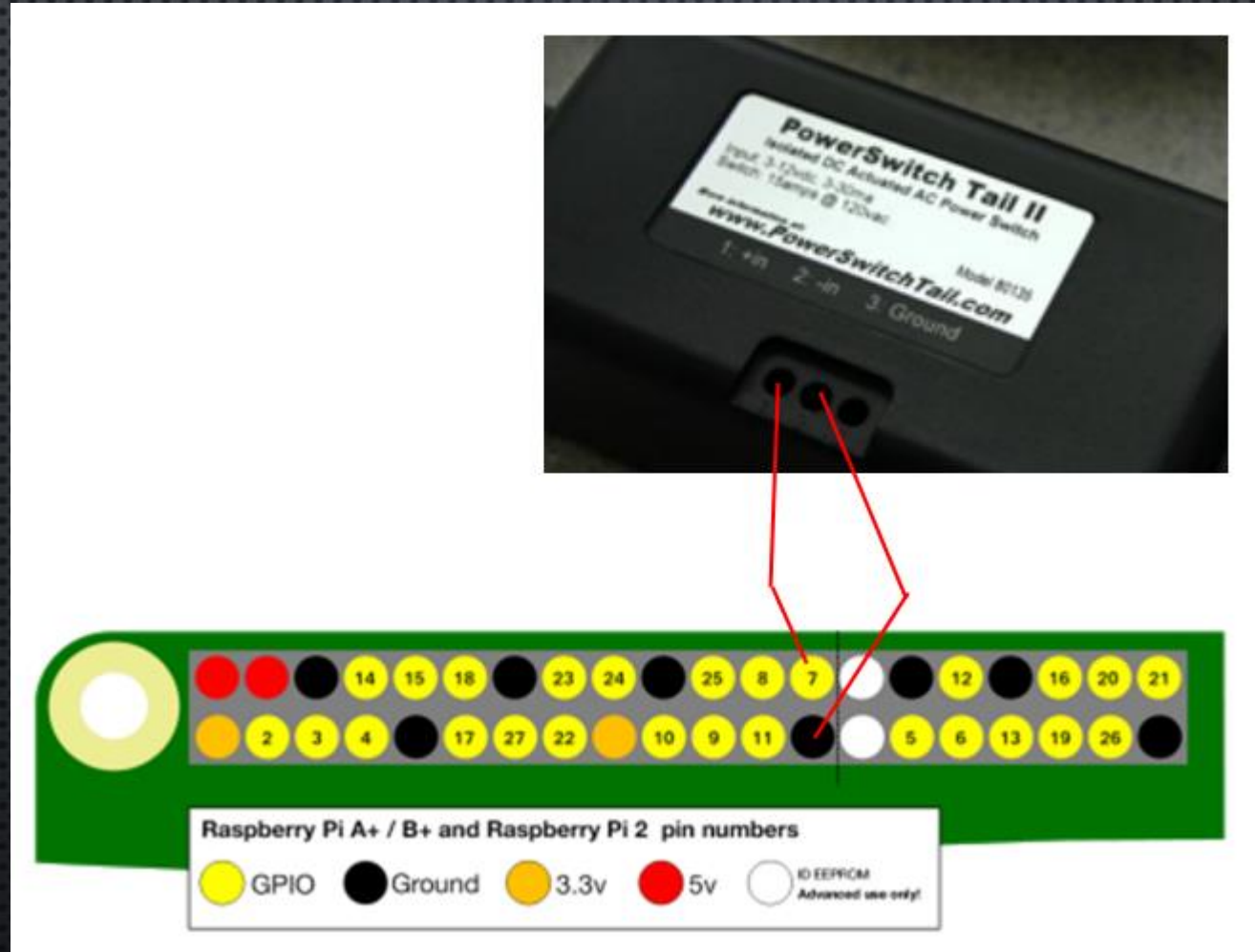
- SAFELY SWITCH 120VAC APPLIANCES
 - NO DANGEROUS 120VAC WIRING REQUIRED
 - ISOLATES RASPBERRY PI
 - UP TO 15 AMP
- CONVENIENT, EASY TO USE
 - SIMPLE AS AN EXTENSION CORD
 - TWO-WIRE CONTROL SIGNAL CONNECTION
 - LED STATUS INDICATOR FOR DEBUGGING



<http://www.powerswitchtail.com/Pages/default.aspx>

<https://cdn-learn.adafruit.com/downloads/pdf/adafruits-raspberry-pi-lesson-13-power-control.pdf>

WIRING DIAGRAM – PST II



<https://cdn-learn.adafruit.com/downloads/pdf/adafruits-raspberry-pi-lesson-13-power-control.pdf>



RASPI GPIO

- `import RPi.GPIO as GPIO`
- `GPIO.setmode(<mode>)`
 - `GPIO.BOARD`
 - `GPIO.BCM`
- `GPIO.setup(<channel>, <in/out>)`
 - `GPIO.OUT`
 - `GPIO.IN`
- `GPIO.input(<channel>)`
- `GPIO.output(<channel>, <state>)`
 - `GPIO.HIGH`
 - `GPIO.LOW`
- `GPIO.cleanup()`

<https://www.raspberrypi.org/learning/physical-computing-with-python/>
<https://sourceforge.net/p/raspberry-gpio-python/wiki/BasicUsage/>

MONGODB

Setup

- `sudo apt-get mongodb`
 - **Requires Jessie build of Raspbian

Start Client

- `mongo`

Useful Commands

- `show dbs`
- `show collections`
- `use <db_name>`
- `db.<db_name>.help()`
- `db.<db_name>.find()`

FLASK WEB MICROFRAMEWORK

Setup

- `sudo pip install flask`

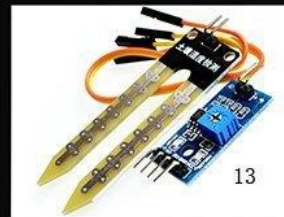
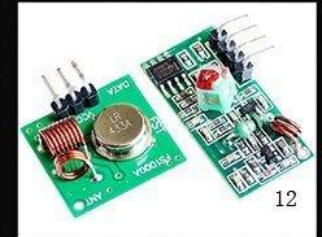
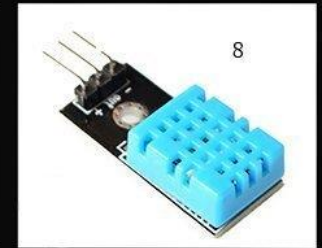
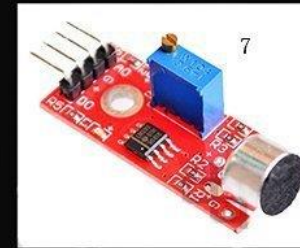
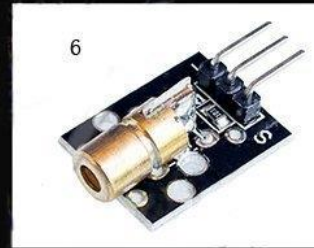
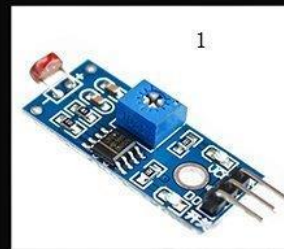
WHY FLASK?

- LIGHTWEIGHT
- SIMPLE TO USE
- FLEXIBLE
- EXTENSIBLE
- WELL DOCUMENTED

<https://www.raspberrypi.org/learning/python-web-server-with-flask/>

GET STARTED

- 16 SENSOR STARTER KIT, \$30 ON AMAZON
- SOLDERLESS BREADBOARD, ~\$3-\$10
- JUMPER WIRES < \$10
- MAYBE SOME RESISTORS, < \$10
- GET DEALS WITH KITS AND A BIT OF RESEARCH
- POWERSWITCH TAIL II, \$26



1 .Photosensitive resistance sensor module 2 .The flame sensor module 3 .The tilt sensor module 4 .Vibration sensor module
5 .Obstacle avoidance sensor module 6 .KY-008 laser head sensor module 7 .Sound sensor module
8 .DHT11 temperature and humidity sensor module 9 .HC-SR04 ultrasonic sensor module 10.HC-SR501 infrared human body induction module
11. MQ-2 gas sensor module 12.315M wireless transceiver module 13.The YL-69 soil moisture sensor module
14.A path tracing module
15.DS1302 real time clock module
16.The raindrops module

<http://goo.gl/OjsfSF>

U CAN 2!

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- GRAVITATE SOLUTIONS
- @CHADBOSCHERT
- WWW.LINKEDIN.COM/IN/CHADBOSCHERT

